

Fresno General Plan Update Scenarios - CONFIDENTIAL DRAFT

5-Apr-12

	Business as Usual (Calthorpe Backcast)	A. Revitalization, Infill, and Transit Corridors within SOI	B. Growth Area Development and Infill within SOI	C. Trend, Expands to SOI	D. Hybrid of A, B, and C
New growth housing unit mix	BAU	A	B	C	D
Single Family Large Lot	70%	15%	16%	31%	24%
Single Family Small Lot	10%	24%	23%	21%	22%
Townhome	7%	20%	19%	15%	17%
Multifamily	12%	41%	42%	33%	38%
New growth housing units					
Single Family Large Lot	55,555	11,845	12,898	24,354	18,910
Single Family Small Lot	7,863	18,650	18,488	16,469	17,104
Townhome	5,860	15,924	14,650	11,892	13,302
Multifamily	9,722	32,581	32,965	26,286	29,685

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5-Apr-12	2035 Annual Results		A. Revitalization, Infill, and Transit Corridors within SOI		B. Growth Area Development and Infill within SOI		C. Trend, Expands to SOI		D. Hybrid of A, B, and C		E. BIA Scenario		
		Result	Diff from Alt C		Result	Diff from Alt C		Result	Diff from Alt C		Result	Diff from Alt A	Diff from Alt C
	SCENARIO	A		B		C		D		E			
	End-State Total Population, 2035	734,533		734,533		734,533		734,533		734,533			
	End-State Total Households, 2035	239,763		239,763		239,763		239,763		239,763			
	Total Greenhouse Gas (GHG) Emissions												
	Total Emissions (Transportation Combustion and Buildings) (MMT)	2.17 MMT	-0.19 MMT	2.22 MMT	-0.14 MMT	2.36 MMT	0.00 MMT	2.23 MMT	-0.13 MMT	2.41 MMT	0.24 MMT	0.05 MMT	
	ICE Fuel Combustion Emissions (MMT)	0.96 MMT	-0.16 MMT	1.01 MMT	-0.11 MMT	1.12 MMT	0.00 MMT	1.01 MMT	-0.11 MMT	1.13 MMT	0.17 MMT	0.01 MMT	
	Building Emissions (Residential and Commercial)	1.21 MMT	-0.03 MMT	1.21 MMT	-0.03 MMT	1.24 MMT	0.00 MMT	1.22 MMT	-0.02 MMT	1.28 MMT	0.07 MMT	0.04 MMT	
	Household Costs												
Fuel and auto, energy, and water costs (2011\$)	\$11,520	-\$1,482	\$11,997	-\$1,005	\$13,002	\$0	\$12,007	-\$995	\$13,143	\$1,624	\$142		
Household fuel and auto costs (2011\$)	\$8,132	-\$1,381	\$8,614	-\$899	\$9,513	\$0	\$8,570	-\$943	\$9,607	\$1,475	\$94		
Household energy and water costs (2011\$)	\$3,387	-\$102	\$3,383	-\$106	\$3,489	\$0	\$3,437	-\$52	\$3,536	\$149	\$47		
Land Consumption													
Greenfield Land Consumed, Gross (sq mi)	21.7 sq mi	-9.9 sq mi	25.1 sq mi	-6.6 sq mi	31.7 sq mi	0 sq mi	25.7 sq mi	-6.0 sq mi	34.2 sq mi	12.4 sq mi	2.5 sq mi		
Greenfield Land Consumed, Gross (ac)	13,909 ac	-6,354 ac	16,055 ac	-4,207 ac	20,263 ac	ac	16,435 ac	-3,828 ac	21,860 ac	7,951 ac	1,597 ac		
Transportation													
VMT (miles)	3.01 B mi	-0.51 B mi	3.19 B mi	-0.33 B mi	3.52 B mi	0.00 B mi	3.17 B mi	-0.35 B mi	3.56 B mi	0.55 B mi	0.03 B mi		
VMT per HH	12,562 mi	-2,133 mi	13,306 mi	-1,389 mi	14,695 mi	mi	13,238 mi	-1,457 mi	14,840 mi	2,278 mi	146 mi		
VMT per Capita	4,100 mi	-696 mi	4,343 mi	-453 mi	4,797 mi	mi	4,321 mi	-475 mi	4,844 mi	744 mi	48 mi		
Fuel Consumed (gal)	121.7 M gal	-20.7 M gal	128.9 M gal	-13.5 M gal	142.4 M gal	0.0 M gal	128.3 M gal	-14.1 M gal	143.8 M gal	22.1 M gal	1.4 M gal		
Fuel Cost (2011\$)	\$0.97 B	-\$165 M	\$1.03 B	-\$108 M	\$1.14 B	\$0 M	\$1.03 B	-\$113 M	\$1.15 B	\$177 M	\$11 M		
Auto Ownership, Maintenance, and Additional Costs (2011\$)	\$0.98 B	-\$166 M	\$1.03 B	-\$108 M	\$1.14 B	\$0 M	\$1.03 B	-\$113 M	\$1.15 B	\$177 M	\$11 M		
ICE Fuel Combustion Emissions (MMT)	0.96 MMT	-0.16 MMT	1.01 MMT	-0.11 MMT	1.12 MMT	0.00 MMT	1.01 MMT	-0.11 MMT	1.13 MMT	0.17 MMT	0.01 MMT		
ICE Fuel Combustion Emissions per Capita (lbs)	2,871 lbs	-487 lbs	3,041 lbs	-317 lbs	3,358 lbs	0 lbs	3,025 lbs	-333 lbs	3,392 lbs	521 lbs	33 lbs		
Criteria Pollutant Emissions (tons)	3,717 tons	-631 tons	3,937 tons	-411 tons	4,347 tons	tons	3,917 tons	-431 tons	4,391 tons	674 tons	43 tons		
Public Health													
Annual Health Incidences	5,090	-864	5,391	-563	5,954	0	5,364	-590	6,013	923	59		
Annual Health Costs (2011\$)	\$81,251,611	-\$13,793,110	\$86,061,987	-\$8,982,734	\$95,044,721	\$0	\$85,624,000	-\$9,420,721	\$95,988,034	\$14,736,423	\$943,313		
Building Energy													
Residential Electricity Consumed (kWh)	1,578 GWh	-54 GWh	1,576 GWh	-57 GWh	1,633 GWh	0 GWh	1,605 GWh	-28 GWh	1,658 GWh	79 GWh	25 GWh		
Residential Natural Gas Consumed (therms)	83,402,521 thm	-1,280,799 thm	83,354,420 thm	-1,328,900 thm	84,683,320 thm	0 thm	84,044,368 thm	-638,952 thm	85,279,833 thm	1,877,312 thm	596,513 thm		
Residential Energy Consumed (Btu)	13.7 tril Btu	-313 bil Btu	13.7 tril Btu	-326 bil Btu	14.0 tril Btu	0.0 tril Btu	13.9 tril Btu	-159 bil Btu	14.2 tril Btu	459 bil Btu	146 bil Btu		
Commercial Energy Consumed (Btu)	7.8 tril Btu	-219 bil Btu	7.9 tril Btu	-210 bil Btu	8.1 tril Btu	0.0 tril Btu	7.8 tril Btu	-221 bil Btu	8.1 tril Btu	226 bil Btu	6 bil Btu		
Total Energy Consumed (Btu)	21.6 tril Btu	-532 bil Btu	21.6 tril Btu	-536 bil Btu	22.1 tril Btu	0.0 tril Btu	21.7 tril Btu	-381 bil Btu	22.3 tril Btu	685 bil Btu	152 bil Btu		
Residential Building Emissions (MMT)	0.76 MMT	-0.02 MMT	0.76 MMT	-0.02 MMT	0.78 MMT	0.00 MMT	0.77 MMT	-0.01 MMT	0.79 MMT	0.03 MMT	0.01 MMT		
Commercial Building Emissions (MMT)	0.45 MMT	-0.01 MMT	0.45 MMT	-0.01 MMT	0.46 MMT	0.00 MMT	0.45 MMT	-0.01 MMT	0.46 MMT	0.01 MMT	0.00 MMT		
Residential Electricity per HH (kWh)	6,583 kWh	-226 kWh	6,573 kWh	-236 kWh	6,809 kWh	0 kWh	6,693 kWh	-117 kWh	6,915 kWh	331 kWh	105 kWh		
Residential Natural Gas per HH (therms)	348 thm	-5 thm	348 thm	-6 thm	353 thm	0 thm	351 thm	-3 thm	356 thm	8 thm	2 thm		
Residential Energy Use per HH (Btu)	90.0 mil Btu	-2.2 mil Btu	90.0 mil Btu	-2.2 mil Btu	92.2 mil Btu	0.0 mil Btu	90.6 mil Btu	-1.6 mil Btu	92.8 mil Btu	2.9 mil Btu	0.6 mil Btu		
Residential Energy Cost (\$)	\$678 mil	-\$21 mil	\$677 mil	-\$22 mil	\$698 mil	\$0 mil	\$688 mil	-\$11 mil	\$708 mil	\$31 mil	\$10 mil		
Residential Energy Cost per HH (\$)	\$2,826	-\$87	\$2,822	-\$91	\$2,913	\$0	\$2,868	-\$45	\$2,954	\$128	\$41		
Water													
Water Consumed (AF)	93,261 AF	-2,988 AF	93,501 AF	-2,747 AF	96,249 AF	AF	94,912 AF	-1,337 AF	97,484 AF	4,223 AF	1,235 AF		
Water Cost (\$)	\$135 mil	-\$3.5 mil	\$135 mil	-\$3.6 mil	\$138 mil	\$0.0 mil	\$136 mil	-\$1.7 mil	\$140 mil	\$5.1 mil	\$1.6 mil		
Water Consumed per HH (gal)	126,747 gal	-4,061 gal	127,074 gal	-3,734 gal	130,808 gal	gal	128,991 gal	-1,817 gal	132,486 gal	5,739 gal	1,678 gal		
Residential Water Cost per HH (\$)	\$562	-\$14	\$561	-\$15	\$576	\$0	\$569	-\$7	\$583	\$21	\$7		
Water Consumed for new households only (AF)	29,127 AF	-2,988 AF	29,367 AF	-2,747 AF	32,115 AF	AF	30,778 AF	-1,337 AF	33,349 AF	4,223 AF	1,235 AF		
Water use per new HH (gal)	103,367 gal	-10,605 gal	104,221 gal	-9,750 gal	113,971 gal	gal	109,227 gal	-4,745 gal	118,353 gal	14,986 gal	4,382 gal		
Water cost for new HH (2011\$)	\$38,437,223	-\$3,453,608	\$38,306,989	-\$3,583,842	\$41,890,831	\$0	\$40,146,823	-\$1,744,008	\$43,501,350	\$5,064,127	\$1,610,519		
Water cost per new HH (2011\$)	\$419	-\$38	\$417	-\$39	\$456	\$0	\$437	-\$19	\$474	\$55	\$18		
Infrastructure (Cumulative results to 2035)													
Cumulative Infrastructure Cost (2011\$)	\$1.27 B	-\$143 M	\$1.33 B	-\$80 M	\$1.41 B	\$0 M	\$1.35 B	-\$63 M	\$1.38 B	\$115 M	-\$27 M		
Cumulative Operations & Maintenance Cost (2011\$)	\$0.30 B	-\$20 M	\$0.31 B	-\$17 M	\$0.32 B	\$0 M	\$0.31 B	-\$11 M	\$0.32 B	\$13 M	-\$7 M		
Cumulative Revenues (\$)	\$4.62 B	\$109 M	\$4.48 B	-\$27 M	\$4.51 B	\$0 M	\$4.60 B	\$90 M	\$4.34 B	-\$278 M	-\$169 M		

EQUIVALENCIES Alt A compared to Alt C		
(Same assumptions used for all scenarios)		
GREENHOUSE GAS EMISSIONS		
Reduces total annual GHGs by the same amount sequestered by 78,000 acres of trees -- or 5 million tree seedlings grown for 10 years.		
HOUSEHOLD COSTS		
\$1,480 savings per household, per year in auto and utility costs.		
LAND CONSUMPTION		
Nearly 10 square miles of land saved.		
TRANSPORTATION		
Over 40,000 cars off Fresno's roads.		
21 million gallons less fuel consumed in 2035 -- over 2,400 tanker trucks' worth of gas, or over a million barrels of oil.		
HEALTH IMPACTS		
\$13.8 million less in healthcare spending for air pollution-related illnesses in 2035.		
ENERGY		
Enough energy saved annually to power over 9,000 homes.		
WATER		
Enough water saved annually to serve over 7,500 homes.		
Over 10,000 gallons saved per new household.		
INFRASTRUCTURE COSTS		
\$162 million less in local spending to build, operate, and maintain infrastructure by 2035.		

EQUIVALENCIES Alt A compared to Alt E		
(Same assumptions used for all scenarios)		
GREENHOUSE GAS EMISSIONS		
Reduces total annual GHGs by the same amount sequestered by 98,000 acres of trees -- or 6.2 million tree seedlings grown for 10 years.		
HOUSEHOLD COSTS		
\$1,620 savings per household, per year in auto and utility costs.		
LAND CONSUMPTION		
12.4 square miles of land saved.		
TRANSPORTATION		
Nearly 44,000 cars off Fresno's roads.		
22 million gallons less fuel consumed in 2035 -- nearly 2,600 tanker trucks' worth of gas, or over 1.1 million barrels of oil.		
HEALTH IMPACTS		
\$14.7 million less in healthcare spending for air pollution-related illnesses in 2035.		
ENERGY		
Enough energy saved annually to power 11,700 homes.		
Nearly 15,000 gallons saved per new household.		
INFRASTRUCTURE COSTS		
\$115 million less in local spending to build, operate, and maintain infrastructure by 2035.		

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2035 Annual Results

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SCENARIO	Result	Diff from Alt C	Result	Diff from Alt C	Result	Diff from Alt C	Result	Diff from Alt C	Result	Diff from Alt C
	A		B		C		D		E	
End-State Total Population, 2035	734,533		734,533		734,533		734,533		734,533	
End-State Total Households, 2035	239,763		239,763		239,763		239,763		239,763	
Total Greenhouse Gas (GHG) Emissions										
Total Emissions (Transportation Combustion and Buildings) (MMT)	2.17 MMT	-8%	2.22 MMT	-6%	2.36 MMT	0%	2.23 MMT	-6%	2.41 MMT	2%
ICE Fuel Combustion Emissions (MMT)	0.96 MMT	-15%	1.01 MMT	-9%	1.12 MMT	0%	1.01 MMT	-10%	1.13 MMT	1%
Building Emissions (Residential and Commercial)	1.21 MMT	-2%	1.21 MMT	-2%	1.24 MMT	0%	1.22 MMT	-2%	1.28 MMT	3%
Household Costs										
Fuel and auto, energy, and water costs (2011\$)	\$11,520	-11%	\$11,997	-8%	\$13,002	0%	\$12,007	-8%	\$13,143	1%
Household fuel and auto costs (2011\$)	\$8,132	-15%	\$8,614	-9%	\$9,513	0%	\$8,570	-10%	\$9,607	1%
Household energy and water costs (2011\$)	\$3,387	-3%	\$3,383	-3%	\$3,489	0%	\$3,437	-1%	\$3,536	1%
Land Consumption										
Greenfield Land Consumed, Gross (sq mi)	21.7 sq mi	-31%	25.1 sq mi	-21%	31.7 sq mi	0%	25.7 sq mi	-19%	34.2 sq mi	8%
Greenfield Land Consumed, Gross (ac)	13,909 ac	-31%	16,055 ac	-21%	20,263 ac	0%	16,435 ac	-19%	21,860 ac	8%
Transportation										
VMT (miles)	3.01 B mi	-15%	3.19 B mi	-9%	3.52 B mi	0%	3.17 B mi	-10%	3.56 B mi	1%
VMT per HH	12,562 mi	-15%	13,306 mi	-9%	14,695 mi	0%	13,238 mi	-10%	14,840 mi	1%
VMT per Capita	4,100 mi	-15%	4,343 mi	-9%	4,797 mi	0%	4,321 mi	-10%	4,844 mi	1%
Fuel Consumed (gal)	121.7 M gal	-15%	128.9 M gal	-9%	142.4 M gal	0%	128.3 M gal	-10%	143.8 M gal	1%
Fuel Cost (2011\$)	\$0.97 B	-15%	\$1.03 B	-9%	\$1.14 B	0%	\$1.03 B	-10%	\$1.15 B	1%
Auto Ownership, Maintenance, and Additional Costs (2011\$)	\$0.98 B	-15%	\$1.03 B	-9%	\$1.14 B	0%	\$1.03 B	-10%	\$1.15 B	1%
ICE Fuel Combustion Emissions (MMT)	0.96 MMT	-15%	1.01 MMT	-9%	1.12 MMT	0%	1.01 MMT	-10%	1.13 MMT	1%
ICE Fuel Combustion Emissions per Capita (lbs)	2,871 lbs	-15%	3,041 lbs	-9%	3,358 lbs	0%	3,025 lbs	-10%	3,392 lbs	1%
Criteria Pollutant Emissions (tons)	3,717 tons	-15%	3,937 tons	-9%	4,347 tons	0%	3,917 tons	-10%	4,391 tons	1%
Public Health										
Annual Health Incidences	5,090	-15%	5,391	-9%	5,954	0%	5,364	-10%	6,013	1%
Annual Health Costs (2011\$)	\$81,251,611	-15%	\$86,061,987	-9%	\$95,044,721	0%	\$85,624,000	-10%	\$95,988,034	1%
Building Energy										
Residential Electricity Consumed (kWh)	1,578 GWh	-3%	1,576 GWh	-3%	1,633 GWh	0%	1,605 GWh	-2%	1,658 GWh	2%
Residential Natural Gas Consumed (therms)	83,402,521 thm	-2%	83,354,420 thm	-2%	84,683,320 thm	0%	84,044,368 thm	-1%	85,279,833 thm	1%
Residential Energy Consumed (Btu)	13.7 tril Btu	-2%	13.7 tril Btu	-2%	14.0 tril Btu	0%	13.9 tril Btu	-1%	14.2 tril Btu	1%
Commercial Energy Consumed (Btu)	7.8 tril Btu	-3%	7.9 tril Btu	-3%	8.1 tril Btu	0%	7.8 tril Btu	-3%	8.1 tril Btu	0%
Total Energy Consumed (Btu)	21.6 tril Btu	-2%	21.6 tril Btu	-2%	22.1 tril Btu	0%	21.7 tril Btu	-2%	22.3 tril Btu	1%
Residential Building Emissions (MMT)	0.76 MMT	-2%	0.76 MMT	-2%	0.78 MMT	0%	0.77 MMT	-1%	0.79 MMT	1%
Commercial Building Emissions (MMT)	0.45 MMT	-3%	0.45 MMT	-3%	0.46 MMT	0%	0.45 MMT	-3%	0.46 MMT	0%
Residential Electricity per HH (kWh)	6,583 kWh	-3%	6,573 kWh	-3%	6,809 kWh	0%	6,693 kWh	-2%	6,915 kWh	2%
Residential Natural Gas per HH (therms)	348 thm	-2%	348 thm	-2%	353 thm	0%	351 thm	-1%	356 thm	1%
Residential Energy Use per HH (Btu)	90.0 mil Btu	-2%	90.0 mil Btu	-2%	92.2 mil Btu	0%	90.6 mil Btu	-2%	92.8 mil Btu	1%
Residential Energy Cost (\$)	\$678 mil	-3%	\$677 mil	-3%	\$698 mil	0%	\$688 mil	-2%	\$708 mil	1%
Residential Energy Cost per HH (\$)	\$2,826	-3%	\$2,822	-3%	\$2,913	0%	\$2,868	-2%	\$2,954	1%
Water										
Water Consumed (AF)	93,261 AF	-3%	93,501 AF	-3%	96,249 AF	0%	94,912 AF	-1%	97,484 AF	1%
Water Cost (\$)	\$135 mil	-3%	\$138 mil	-3%	\$143 mil	0%	\$136 mil	-1%	\$140 mil	1%
Water Consumed per HH (gal)	126,747 gal	-3%	127,074 gal	-3%	130,808 gal	0%	128,991 gal	-1%	132,486 gal	1%
Residential Water Cost per HH (\$)	\$562	-3%	\$561	-3%	\$576	0%	\$569	-1%	\$583	1%
Water Consumed for new households only (AF)	29,127 AF	-9%	29,367 AF	-9%	32,115 AF	0%	30,778 AF	-4%	33,349 AF	4%
Water use per new HH (gal)	103,367 gal	-9%	104,221 gal	-9%	113,971 gal	0%	109,227 gal	-4%	118,353 gal	4%
Water cost per for new HH (2011\$)	\$38,437,223	-8%	\$38,306,989	-9%	\$41,890,831	0%	\$40,146,823	-4%	\$43,501,350	4%
Water cost per new HH (2011\$)	\$419	-8%	\$417	-9%	\$456	0%	\$437	-4%	\$474	4%
Infrastructure (Cumulative results to 2035)										
Cumulative Infrastructure Cost (2011\$)	\$1.27 B	-10%	\$1.33 B	-6%	\$1.41 B	0%	\$1.35 B	-4%	\$1.38 B	-2%
Cumulative Operations & Maintenance Cost (2011\$)	\$0.30 B	-6%	\$0.31 B	-5%	\$0.32 B	0%	\$0.31 B	-3%	\$0.32 B	-2%
Cumulative Revenues (2011\$)	\$4.62 B	2%	\$4.48 B	-1%	\$4.51 B		\$4.60 B	2%	\$4.34 B	-4%

(Same assumptions used for all scenarios)		2005
Growth projections assume 79,000 new units and 125,000 new jobs (by 2035, relative to 2010) for ALL scenarios.		Baseline
Transportation GHG emissions include CO2-equivalent (CO2e) from passenger vehicle fuel combustion. Building emissions include CO2e from residential and commercial electricity and natural gas use.		454,736
Household costs reflect averages for ALL households (including existing households), expressed in 2011 dollars. Specific cost assumptions are further detailed below.		147,945
Land consumption estimated based on per-capita rates, which vary by Land Development Category and are calibrated to past development patterns.		2.4 MMT
* All transportation results assume modest improvements in fuel economy (27 mpg by 2035), and LCFS-based emissions (A 10% reduction, or ~17.3 lbs CO2e/gal by 2035).		1.1 MMT
Fuel cost assumed to reach \$8 per gallon by 2035. (2011\$)		1.3 MMT
Auto ownership and maintenance costs assumed to be \$0.32 per mile (2011\$).		
Per-mile criteria pollutant emissions rates from EMFAC 2007.		
Estimated based on tons of criteria pollutants emitted. Health incidence and valuation assumptions developed by TIAx for the American Lung Association (Oct 2011).		
Residential electricity and natural gas use for new units based on CEC RASS data by residential type, for Fresno's climate zone (Title 24 zone 13). Average energy use for existing units (7,860 kWh/unit and 420 thm/unit) based on normalized monthly usage for the City of Fresno, as reported by PG&E to the COF.		2.3 B mi
Commercial energy use for new and existing buildings based on average energy intensity of all commercial floorspace in Fresno's climate zone (CEC Forecasting Zone 3) - 12.8 kWh/sq ft; 0.27 thm/sq ft. Note that commercial energy use does not comprise all "non-residential" use, as it does not include industrial energy use.		15,498 mi
Electricity emissions: 0.45 lbs/kWh in 2035 per Sustainable Fresno Division based on input from PG&E. Natural gas emissions: 11.7 lbs/therm state average (no change, since emissions are constant).		5,042 mi
Electricity cost: \$0.35 in 2035; natural gas cost: \$1.50 per therm by 2035 (2011\$). Per Sustainable Fresno Division, March 2012.		0.1 B gal
Water use based on average per-capita indoor water use rates, and outdoor rates based on Fresno's evapotranspiration zone and assumptions about lot size and irrigated area.		1 MMT
Water cost: \$1,500 per acre-foot (2011\$), per Sustainable Fresno Division.		5,120 lbs
Infrastructure costs are one-time costs that include the construction of streets, parks, water, and wastewater infrastructure. Operations and maintenance costs are ongoing costs that are incurred annually to maintain that infrastructure. Costs vary by dwelling unit type. Totals reflect cumulative costs to 2035.		87,578 tons

Note: Express health impacts and costs only as DIFFERENCES between scenarios (e.g., Compared to Scenario C, Scenario A would result in \$13.8 million less in health costs in 2035).